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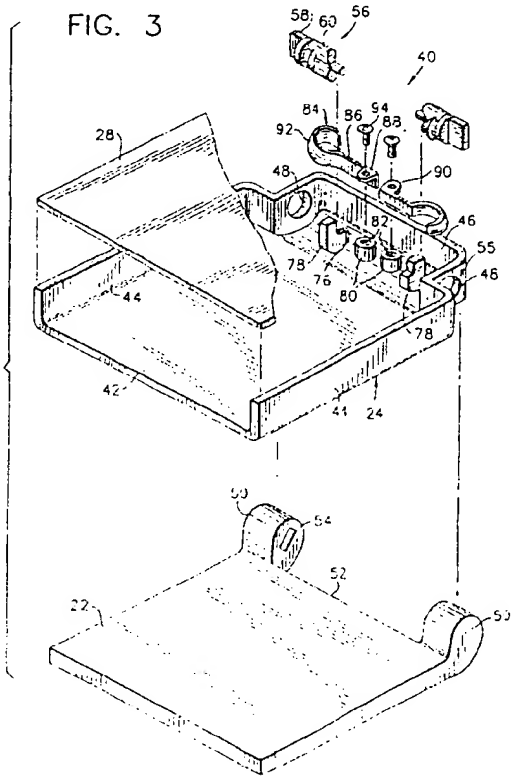
(54) Hinge mechanism for a portable telephone

(57) A unique hinge construction is provided for pivotally connecting a cover (22) to a main body (24) of a transceiver. The main body (24) comprises a base (42) and upstanding sidewalls (44) and an endwall (46). Movable between a closed position generally overlying the main body (24) and an operative angularly disposed position, the cover (22) includes a pair of spaced apart ears (50) projecting from an end thereof, said ears (50) having opposed key slots (54) formed therein being aligned with opposed mounting bores (48) in the sidewalls (44) adjacent the endwall (46). A pair of hinge shafts (56) are rotatably received in an associated one of the mounting bores (48) in the sidewalls (44) on the main body (24). Each hinge shaft (56) includes a key member (58) engageable with an associated one of the key slots (54) in the opposed ears (50) for rotation therewith and a central member (60) having a uniformly contoured outer surface defined by elevationally opposed convex shaped lobes, laterally opposed concave shaped depressions, and smooth transition zones joining the lobes and said depressions. A pair of spring members (84), each having a convex shaped surface (92) fixed to the main body (24) are biased into engagement with the uniformly contoured outer surface of its associated shaft means (56) for maintaining the cover (22) closed in one instance and in at least one operative position relative to the main body (24) in another instance.

FIG. 3



EP 0 772 333 A2

Description

This invention relates generally to hinged housings for miniaturized electronic equipment and more particularly to portable cellular transceivers which utilize hinged housings for folding elements.

An ultimate object of communication is, of course, to enable information to be transmitted or exchanged at once anytime, from anywhere, and by anybody. In addition to conventional intercommunication between fixed points, mobile communication has been gradually developed. Mobile communication means a communication between a mobile body such as ship, automobile or airplane (including a human being) and a fixed point such as home or office, and also means an intercommunication between two mobile bodies. In recent years, a portable telephone or a cordless telephone as a kind of means for carrying out the mobile communication has been extensively developed.

In general, a telephone is used with a receiver section put to the ear and a transmitter section kept near the mouth. So also in a portable telephone, it is necessary to ensure a sufficient distance between the receiver section and the transmitter section. In this circumstance, a conventional portable telephone itself is relatively long and large in size.

Telephones utilizing two housing elements, connected with some types of hinging mechanism, are common in wireline telephone sets and have become more common in landline wireless extension phones. This folding arrangement allows for the telephone to be more compact when the two housings are folded upon themselves.

Radiotelephones which utilize this type of design typically have most of the electronics within the larger of the two housings. For good acoustical performance, the cover must be held in an optimum position relative to the body and the cover helps direct sound pressure towards the microphone element.

Typical of known constructions are the disclosures in the following U.S. patents all disclose cooperating spring and cam assemblies associated with hinge constructions for a foldable telephone and associated door:

Patent No.	Inventor(s)	Issued
5,257,310	Takagi et al.	10/26/93
5,185,790	Mischenko	02/09/93
4,897,873	Beutler et al.	01/30/90.

While each of the foregoing constructions represented advances in the state of the art at the time that they were introduced, it was in an effort to further improve upon those advancements that the present invention was conceived and has now been reduced to practice.

According to one aspect of the present invention, there is provided a hinge apparatus for hinging two housings of a transceiver, the apparatus comprising:

hinge means for rotatably coupling the housings about an axis of rotation, having a hinge shaft with a circumferential surface defined by first and second surface portions; and

spring means having a surface for contacting the hinge shaft, which is biased towards the hinge shaft; wherein:

the first surface portion of the hinge shaft is shaped to urge against the contact surface of the spring means as the first housing is rotated towards or away from a first predetermined angular position relative to the second housing;

and the second surface portion of the hinge shaft is shaped to abut the contact surface of the spring means so as to maintain the first housing at the first predetermined angular position relative to the second when the second surface portion opposes the contact surface of the spring means.

The second surface portion of the hinge shaft may be shaped to seat the contact surface of the spring means so as to maintain the first housing at the first predetermined angular position relative to the second housing when the second surface portion opposes the contact surface of the spring means. This arrangement provides a well defined feeling when the first housing is moved to or from the first predetermined angular position. This feeling is further defined if the second surface portion of the spring means is shaped to conform to that of the contact portion of the spring means.

Smooth transition portions between adjacent surface portions of the hinge shaft reduce abrupt movement of the first housing relative to the second when moving to or from the predetemined angular position.

The hinge shaft may have one or more further surface portions which are shaped to maintain the first housing at a respective further predetermined position when that portion opposes the contact surface of the spring means.

Such surface portions may be arranged symmetrically about the hinge shaft. For example, if the shaft has one further surface portion, namely a third surface portion, then this third surface portion would be angularly disposed from the second surface portion by around 180 degrees. Alternatively, if the hinge shaft had three such surface portions, then these portions would be angularly spaced by 120 degrees. An advantage of this type of arrangement is that the hinge shaft does not have to be specifically aligned to a certain part of the housings during production of the hinging apparatus. Hence, production of the apparatus is simplified.

Preferably the circumferential surface of the hinge shaft is uniform, such as in the above case when the second and third portions are 180 degrees apart. In this event, only one type of hinge shaft is required, even when the hinge apparatus comprises two hinge shafts

and associated spring means, one for each side of the housings. Further, this hinge shaft does not have redundant portions which are only used when the hinge shaft is used for the opposite side of the housings.

The hinge shaft may have a third surface portion for maintaining the first housing closed to the second housing. In this event, it is preferable that this third surface portion is shaped to partially seat the contact surface of the spring means to maintain the housings closed. This has the advantage that the first housing can be easily moved from the closed position. Further, it means that a shaft having a symmetrical surface with second and third portions 180 degrees apart can be used, even when the first housing is required to have a stable position at an angle less than 180 degrees from the closed position. for example. Thus , the aforementioned benefits associated with the use of hinge shafts having symmetrical, uniform circumferential surfaces can be obtained.

According to another aspect of the present invention, there is provided a transceiver comprising first and second housings and a hinge apparatus of the invention.

In one embodiment a hinge apparatus is provided for pivotally connecting a main body and a cover therefor enabling movement of the cover through a range of positions angularly disposed relative to the main body. It comprises shaft means having a longitudinal axis journaled for rotation on the main body at longitudinally spaced locations, the shaft means including keying means engageable with the cover for rotation therewith and a central member having a uniformly contoured outer surface defined by elevationally opposed convex shaped lobes, laterally opposed concave shaped depressions, and smooth transition zones joining the lobes and the depressions. The hinge apparatus also comprises spring means having a convex shaped surface fixed to the main body engageable with the uniformly contoured outer surface of the shaft means for maintaining the cover in at least one position relative to the main body.

In another embodiment, a transceiver comprises a main body including a base, and sidewalls and an endwall upstanding from the base and having opposed aligned mounting bores in the sidewalls adjacent the endwall, each mounting bore extending from an outside end to an inside end It also comprises a cover pivotally mounted on the main body for movement between a closed position generally coplanar with and overlying the main body and an operative position angularly disposed relative to the main body, the cover including a pair of spaced apart ears projecting from an end thereof, the ears having opposed key slots formed therein being aligned with the mounting bores in the sidewalls. Further, it has a pair of hinge shafts, each hinge shaft having a longitudinal axis rotatably received in an associated one of the mounting bores in the sidewalls on the main body and including a key member engageable with an associated one of the key slots in the opposed ears for rotation therewith and a central member having a uniformly contoured outer surface defined by elevationally opposed convex shaped lobes, laterally opposed concave shaped depressions, and smooth transition zones joining the lobes and the depressions. Moreover, the transceiver comprises a pair of spring members, each having a convex shaped surface fixed to the main body biased into engagement with the uniformly contoured outer surface of the shaft means for maintaining the cover in at least one operative position relative to the main body.

The main body may include a cover plate attached to the upstanding sidewalls and endwall and generally parallel to and spaced from the base, and the operative position preferably occurs with the cover inclined about 135° with respect to the cover plate, each of the spring members being engaged with the depressions of an associated one of the central members.

The main body may have a pair of spaced apart integral ribs upstanding from the base, each rib being spaced from an associated one of the sidewalls and having a bearing surface thereon. In this event, each of the hinge shafts includes a stub shaft which extends away from the central member and which is rotatably engageable with the rib bearing surface. The spring members are positioned to bias the stub shaft into engagement with the rib bearing surface.

Also each of the hinge shafts may include a bearing plate intermediate the key member and the central member, and a plurality of resilient locking fingers fixed to the bearing plate and extending from a plurality of circumferentially spaced locations thereon and at similar radial distances from the longitudinal axis in a direction away from the key member. Each of the locking fingers terminates at a transversely extending locking tang. Each locking tang has a cam surface engageable with an associated one of the mounting bores upon insertion of the hinge shaft into an outside end of its associated mounting bore, such that the locking tangs cause the locking fingers to be depressed toward the longitudinal axis until they exit from an inside end of the mounting bore whereupon the locking fingers snap radially outwardly and the locking tangs prevent removal of the hinge shaft from the sidewall.

Further, the main body may have a pair of spaced apart integral support posts for the spring members, which are upstanding from the base intermediate the sidewalls, each of the support posts having a bore therein. In a preferred embodiment, each of the spring members includes an elongated shank with a transverse mounting flange at one end thereof having a fastener hole therein, and a generally U-shaped resilient biasing portion interposed between the endwall and the contoured outer surface of the central member for holding the stub shaft firmly in engagement with the rib bearing surface. A fastener is receivable through the fastener hole in an associated one of the mounting flanges and

threadedly engageable with the bore in the associated support post for mounting each spring member to the main body.

The main body optionally includes a lower case attached to the upstanding sidewalls and endwall and generally parallel to and spaced from the base, and the cover overlies and is generally contiguous to the main body when in a closed position. Each of the spring members is engaged with one of the lobes of an associated one of the central members such that a closing torque is applied to the hinge shafts, to bias the cover to the closed position.

In another embodiment, a hinge apparatus is provided with a main body including a base, and sidewalls and an endwall upstanding from the base and having opposed aligned mounting bores in the sidewalls adjacent the endwall. It is also provided with a cover pivotally mounted on the main body for movement between a closed position generally coplanar with and overlying the main body and through a range of positions angularly disposed relative to the main body. Further it has shaft means having a longitudinal axis journaled for rotation on the main body at longitudinally spaced locations, the shaft means including keying means engageable with the cover for rotation therewith and a central member having a uniformly contoured outer surface defined by elevationally opposed convex shaped lobes, laterally opposed concave shaped depressions, and smooth transition zones joining the lobes and the depressions. Furthermore, the hinge apparatus comprises spring means having a convex shaped surface fixed to the main body engageable with the uniformly contoured outer surface of the shaft means for maintaining the cover in at least one position relative to the main body.

The cover may include a pair of spaced apart ears projecting from an end thereof, the ears having opposed key slots formed therein being aligned with the mounting bores in the sidewalls. Also, the shaft means may include a pair of hinge shafts, each hinge shaft having a longitudinal axis rotatably received in an associated one of the mounting bores in the sidewalls on the main body, and including a key member engageable with an associated one of the key slots in the opposed ears for rotation therewith.

Preferably the main body includes a cover plate attached to the upstanding sidewalls and endwall and is generally parallel and spaced from the base, in which case the operative position preferably occurs with the cover inclined about 135° with respect to the cover plate, each of the spring members being engaged with the depressions of an associated one of the central members.

Again, the main body may have a pair of integral ribs upstanding from the base, each of the ribs being spaced from an associated one of the sidewalls and having a bearing surface thereon. In this event, each of the hinge shafts includes a stub shaft which extends away from the central member and which is rotatably engageable with the rib bearing surface. The spring members are positioned to bias the stub shaft into engagement with the rib bearing surface.

Also, each of the hinge shafts may include a bearing plate intermediate the key member and the central member, and a plurality of resilient locking fingers fixed to the bearing plate and extending from a plurality of circumferentially spaced locations thereon and at similar radial distances from the longitudinal axis in a direction away from the key member. Each of the locking fingers terminates at a transversely extending locking tang. Each locking tang has a cam surface engageable with an associated one of the mounting bores upon insertion of the hinge shaft into an outside end of its associated mounting bore, such that the locking tangs cause the locking fingers to be depressed toward the longitudinal axis until they exit from an inside end of the mounting bore whereupon the locking fingers snap radially outwardly and the locking tangs prevent removal of the hinge shaft from the sidewall.

Further, the main body may have a pair of spaced apart integral support posts for the spring members which are upstanding from the base intermediate the sidewalls, each of the support posts having a bore therein. Each of the spring members preferably includes an elongated shank with a transverse mounting flange at one end thereof having a fastener hole therein, and a generally U-shaped resilient biasing portion interposed between the endwall and the contoured outer surface of the central member for holding the stub shaft firmly in engagement with the rib bearing surface.

A fastener is provided which is receivable through the fastener hole in an associated one of the mounting flanges and threadedly engageable with the bore in the associated support post for mounting each spring member to the main body.

The main body of the hinge apparatus may include a lower case attached to the upstanding sidewalls and endwall and generally parallel and spaced from the base. In this event, the cover overlies and is generally contiguous to the main body when in a closed position, each of the spring members being engaged with one of the lobes of an associated one of the central members such that a closing torque is applied to the hinge shafts, biasing the cover to the closed position.

Thus, according to the present invention, a unique hinge construction is provided for pivotally connecting a cover to a main body of a transceiver. In a preferred embodiment, the main body comprises a base and upstanding sidewalls and endwalls. Movable between a closed position generally overlying the main body and an operative angularly disposed position, the cover includes a pair of spaced apart ears projecting from an end thereof, the ears having opposed key slots formed therein being aligned with opposed mounting bores in the sidewalls adjacent one of the endwalls. A pair of hinge shafts are rotatably received in an associated one of the mounting bores in the sidewalls on the main body. Each hinge shaft includes a key member engageable

with an associated one of the key slots in the opposed ears for rotation therewith and a central member having a uniformly contoured outer surface defined by elevationally opposed convex shaped lobes, laterally opposed concave shaped depressions, and smooth transition zones joining the lobes and the depressions. A pair of spring members, each having a convex shaped surface fixed to the main body are biased into engagement with the uniformly contoured outer surface of its associated shaft means for maintaining the cover closed in one instance and in at least one operative position relative to the main body in another instance.

More specifically, the portable transceiver of the invention typically comprises a main body including a speaker, a microphone, and a keypad; a cover rotatably mounted to the main body, the cover covering at least the keypad section when the cover is in a closed condition; and a cover holding mechanism for rotatably holding the cover with respect to the main body, the cover holding mechanism including a biasing mechanism for exerting a biasing force to the cover so as to maintain the cover closed in one instance and, in another instance, at a stable position in a rotational direction when the cover is in an opened condition.

In using the transceiver of the invention, when the cover is opened, it is held in a stable position where the cover is inclined at a predetermined angle (e.g. 135°) with respect to the main body by the cover holding mechanism. in this stable position, the cover also functions as a voice reflecting and collecting board.

It is therefore, one object of the present invention to provide a moveable joint for connecting the cover to the main body of a transceiver.

It is a further object of the present invention to produce a more defined feeling for the user when the cover is opened or closed.

It is still a further object of the invention to provide a hinge mechanism for the cover of a transceiver which can be easily operated in a substantially fail-safe manner.

It is still another object of the invention to provide such a hinge mechanism which is of simplified design, uses readily available materials, and can be inexpensively manufactured and maintained.

Accordingly, these and other objects are realized in the present invention which encompasses a portable transceiver having a main housing and an attached movable cover utilizing a minimum of parts as described herein.

Other and further features, advantages, and benefits of the invention will become apparent in the following description taken in conjunction with the following drawings. It is to be understood that the foregoing general description and the following detailed description are exemplary and explanatory but are not to be restrictive of the invention. The accompanying drawings which are incorporated in and constitute a part of this invention, illustrate one of the embodiments of the invention, and, together with the description, serve to explain the principles of the invention in general terms. Like numerals refer to like parts throughout the disclosure.

Figure 1 is a plan view of a portable transceiver according to a preferred embodiment of the present invention;

Figure 2 is a side view of Figure. 1;

Figure 3 is a perspective exploded view illustrating specific components of the transceiver of Figures 1 and 2 which embody the present invention:

Figure 4 is a detail perspective view of assembled components illustrated in Figure 3;

Figure 5 is a cross section view taken along line 5--5 in Figure 4;

Figure 6A is cross section view taken along line 6A--6A in Figure 5 to illustrate one relative position of movable components; and

Figures 6B and 6C are cross section views, similar to Figure 6A illustrating other successive relative positions of the movable components.

There will first be described a schematic arrangement of a portable transceiver 20 which embodies the present invention with reference to Figures 1 and 2. In both Figures 1 and 2, an opened condition of a cover 22 of the portable transceiver is depicted. A main body 24 of the portable transceiver is comprised of an upper case 26 and a lower case 28. A receiver section 30 accommodating a speaker therein is provided at an upper end portion of the main body 24. A display section 32 such as a liquid crystal display and a keypad section 34 having a dialing function or the like are provided at a middle portion of the main body 24. A transmitter section 36 accommodating a microphone therein may be provided at a lower end portion of the main body 24. The reason for providing the transmitter section 36 at the lower end portion of the main body 24 is that the distance between the receiver section 30 and the transmitter section 36 is intended to be made as large as possible notwithstanding the fact that the main body 24 is so compact.

Reference numeral 38 denotes an antenna extendably provided at a side portion of the main body 24. The cover 22 is rotatably mounted in the vicinity of the lower end portion of the main body 24. The cover 22 functions to cover at least some of the keypad section 34 when it is in a closed condition, while functioning as a voice reflecting and collection board for the transmitter section 36 when it is in an opened condition. While the cover 22 is rotatably mounted to the main body 24 as mentioned above, it is stably held. in one instance, in a closed po-

sition overlying the keypad section 34 indicated by a dash-dot line in Figure 2 and, in another instance, in an operative position inclined at a predetermined angle with respect to the main body 24 by means of a cover holding mechanism which will be hereinafter described.

Turn now to Figures 3-5 for the description of a hinge mechanism 40 for pivotally mounting the cover 22 on the main body 24. The hinge mechanism serves to keep the keypad cover in either the opened or closed position. In a manner to be described, the hinge mechanism also serves to return the cover to a stable (opened) position if the cover is moved beyond that position. The opened position is about 135° from the stable closed position.

The main body 24 includes a base 42, and sidewalls 44 and an endwall 46 upstand from the base. Opposed aligned mounting bores are formed in the sidewalls 44 adjacent the endwall 46 and each mounting bore is a throughbore.

As noted earlier, the cover 22 is pivotally mounted on the main body 24 for movement between a closed position generally coplanar with and overlying the keypad section 34 and an operative position angularly disposed relative to the main body. The cover includes a pair of spaced apart ears 50 projecting from an end 52 of the cover 22. The ears have opposed key slots 54 formed therein so as to be aligned with the mounting bores 48 in the sidewalls when the cover is attached to the main body. The sidewalls 44 may be recessed as indicated at 55, in order to properly mate with the ears 50 while maintaining the overall rectangular outline for the transceiver 20.

A pair of hinge shafts 56 are rotatably received, each in an associated one of the mounting bores 48 in the sidewalls 44 on the main body. Each hinge shaft includes, at one end, a key member 58 engageable with an associated one of the key slots 54 in the opposed ears 50 for rotation therewith and a central member 60 having a uniformly contoured outer surface defined by elevationally opposed convex shaped lobes 62, laterally opposed concave shaped depressions 64, and smooth transition zones 66 joining the lobes and the depressions.

Each of the hinge shafts 56 further includes a bearing plate 68 intermediate the key member 58 and the central member 60. Additionally, a plurality of resilient locking fingers 70 are fixed to the bearing plate 68 and extend from a plurality of circumferentially spaced locations thereon and at similar radial distances from a longitudinal axis of the hinge shaft 56 in a direction away from the key member. Each of the locking fingers 70 terminates at a transversely extending locking tang 72. Each locking tang has a cam surface 74 (Figure 5) which is engageable with an associated one of the mounting bores 48 upon insertion of the hinge shaft into an outside end of its associated mounting bore, such that the locking tangs cause the locking fingers to be depressed toward the longitudinal axis of the hinge shaft 56 until they exit from an inside end of the mounting bore. Upon exiting from the mounting bore 48, the locking fingers 70 snap radially outwardly and the locking tangs 72 prevent removal of the hinge shaft from the sidewall 44. Each of the hinge shafts 56 also includes a stub shaft 74 which extends away from the central member 60. The stub shaft 74 is rotatably engageable with a rib bearing surface 76 which will now be described.

A pair of spaced apart integral ribs 78 are upstanding from the base 42, each rib being spaced from an associated one of the sidewalls 44. Each rib also has the bearing surface 74 formed thereon on which the stub shaft 74 is rotatably engaged.

Also viewing Figure 3, a pair of spaced apart integral support posts 80 upstand from the base 42 intermediate the sidewalls 44 and each of the support posts has a vertically oriented bore 82 therein. A pair of spring members 84 are interposed between the end wall 46 and the central member 60 of each of the hinge shafts 56, in each instance to bias the stub shaft 74 into engagement with the rib bearing surface 76. Each of the spring members 84 includes an elongated shank 86 with a transverse mounting flange 88 at one end thereof having a fastener hole 90 therein and a generally U-shaped resilient biasing portion 92. A fastener 94 which may be a self-threading screw is receivable through the fastener hole 90 in an associated one of the mounting flanges 88 and becomes threadedly engageable with tie bore 82 in the associated support post 80 for mounting each spring member 84 to the main body 24. One of the spring members 84 is interposed between the endwall 46 and the contoured outer surface of the central member 60 for holding the stub shaft 74 firmly in engagement with the rib bearing surface 76. The other of the spring members 84 is reversed as is its associated rib 78. In this reversed construction, the biasing portion 92 of the spring member 84 bears against the central member 60 of its associated hinge shaft 56 in the direction of the endwall 46.

The biasing portion 92 of each of the spring members 84 has a convex shaped outer surface which is biased into engagement with the uniformly contoured outer surface of the central member 60 of the hinge shaft 56 for maintaining the cover 22 either in the closed position or in at least one operative position relative to the main body 24.

To complete the description of the construction of the main body 24, viewing Figure 3 again, it is seen that the lower case 28 is suitably attached to the upstanding sidewalls 44 and endwall 46 in a manner not shown so as to be generally parallel to and spaced from the base. Being so positioned, the cover plate thereby encapsulates the hinge mechanism 40 within the main body 24 to keep it protected and isolated from the elements.

As noted, each of the hinge shafts 56 include a central member 60 which is engaged by the biasing portion 92 of an associated one of the spring members 84. It can be the that the central member 60 is a "peanut" shaped section against which the spring member 84

bears or presses. This spring member associated with each hinge shaft 56 serves to rotate the shaft about its longitudinal axis to either a closed position or to a stable opened position. The closed position is illustrated in Figure 6C wherein the spring member 84 bears against the transition zone 66 of the central member 60 of the hinge shaft 56 and causes a biasing moment in a counterclockwise direction to hold the cover 22 firmly against the main body 24. As the cover 22 is opened, it passes through a "metastable" position illustrated in Figure 6B whereat the spring member 84 bears against the lobe 62. With continued rotation of the cover 22, it reaches the operative position illustrated in Figure 6A which occurs with the cover inclined about 135° with respect to the plane of the main body. With the cover 22 so inclined, each of the spring members 84 is engaged with the depressions 64 of an associated one of the central members 60. The cross sectional shape of the face of the spring member bearing on the hinge shaft is suitably curved to conform to the "peanut" cross section of the hinge shaft.

This arrangement of the curved spring members and "peanut" shaped hinge shaft will provide a more defined feeling to the user when the cover 22 is opened or closed. The forces to close the cover will be greater for a given spring force due to the "peanut" shape. In this manner, a greater opening and closing torque is provided while using a weaker spring.

While preferred embodiments of the invention have been disclosed in detail, it should be understood by those skilled in the art that various other modifications may be made to the illustrated embodiments without departing from the scope of the invention as described in the specification and defined in the appended claims.

Claims

1. A hinge apparatus for hinging two housings (22,24) of a transceiver (20), the apparatus comprising:

   hinge means (56) for rotatably coupling the housings (22,24) about an axis of rotation, having a hinge shaft (60) with a circumferential surface defined by first (62) and second surface portions (64); and
   spring means (84) having a surface (92) for contacting the hinge shaft (60), which is biased towards the hinge shaft (60);
   wherein :
   the first surface portion (62) of the hinge shaft (60) is shaped to urge against the contact surface (92) of the spring means (84) as the first housing (22) is rotated towards or away from a first predetermined angular position relative to the second housing (24); and
   the second surface portion (64) of the hinge shaft (60) is shaped to abut the contact surface (92) of the spring means (84) so as to maintain the first housing (22) at the first predetermined angular position relative to the second (24) when the second surface portion (64) opposes the contct surface (92) of the spring means (84).

2. A hinge apparatus as claimed in claim 1, wherein the second surface portion (64) of the hinge shaft (60) is shaped to seat the contact surface (92) of the spring means (84) so as to maintain the first housing (22) at the first predetermined angular position relative to the second (24) when the second surface portion (64) opposes the contact surface (92) of the spring means (84).

3. A hinge apparatus as claimed in claim 1 or 2, wherein the second surface portion (64) of the hinge shaft (60) is shaped to conform to that of the contact surface (92) of the spring means (84) so as to maintain the first housing (22) at the first predetermined angular position relative to the second (24) when the second surface portion (64) opposes the contact surface (92) of the spring means (84).

4. A hinge apparatus as claimed in any preceding claim, wherein the circumferential surface of the hinge shaft (60) is further defined by a third surface portion which is shaped to maintain the first housing (22) at a second predetermined angular position relative to the second housing (24) when the third surface portion (64) opposes the contact surface (92) of the spring means (84).

5. A hinge apparatus as claimed in claim 4, wherein the surface portions (64) of the hinge shaft (60) which are shaped to maintain the first housing (22) at predetermined angular positions relative to the second housing (24) are arranged symmetrically about the hinge shaft (60).

6. A hinge apparatus as claimed in claim 5, wherein the second and third surface portions (64) of the hinge shaft (60) are 180 degrees apart.

7. A hinge apparatus as claimed in claim 5 or 6, wherein the second predetermined angular position is that at which the first housing (22) is closed to the second housing (24).

8. A hinge apparatus as claimed in claim 7, wherein the third surface portion of the hinge shaft (60) is shaped to partially seat the contact surface (92) of the spring means (84) when the first housing (22) is closed to the second housing (24), so as to maintain the housings (22) closed.

9. A hinge apparatus as claimed in claim 4, wherein

the surface portions (64) of the hinge shaft (60) which are shaped to maintain the first housing (22) at predetermined angular positions relative to the second housing (24) are arranged non-symmetrically about the hinge shaft (60).

10. A hinge apparatus as claimed in claim 9, wherein the second and third surface portions of the hinge shaft (60) are about 135 degrees apart.

11. A hinge apparatus as claimed in any preceding claim, wherein the circumferential surface of the hinge shaft (60) is further defined by a smooth transition portion (66) between adjacent surface portions (62,64).

12. A hinge apparatus as claimed in any preceding claim, wherein the contact surface (92) of the spring means (84) is convex and the second and/or third surface portion (64) of the hinge shaft (60) is concave.

13. A hinge apparatus as claimed in any preceding claim, wherein the first surface portion (62) of the hinge shaft (60) is defined by opposing convex lobes.

14. A hinge apparatus as claimed in any preceding claim, wherein the circumferential surface of the hinge shaft (60) is uniformly contoured.

15. A transceiver comprising:

a first housing (22;24);
a second housing (24;22); and
a hinge apparatus as claimed in any preceding claim.

16. A transceiver as claimed in claim 15, wherein:
the first housing (22;24) comprises a mounting bore (48) for receiving an associated hinge means (56).

17. A transceiver as claimed in claim 15 or 16, wherein the hinge means (56) comprises keying means (58) for engaging with an associated slot (48) in the second housing (24;22).

18. A transceiver as claimed in claim 17, wherein the hinge means (56) comprises:

a bearing plate (68) between the keying means (58) and the hinge shaft (60); and
locking means (70,72) for preventing removal of the hinge means (56) from the second housing (24;22).

19. A transceiver as claimed in claim 18, when dependent upon claim 16, wherein the locking means (70,72) comprises a plurality of locking fingers (70) fixed to the bearing plate (68) and extending from a plurality of circumferentially spaced locations thereon and at similar radial distances from the axis of rotation in a direction away from the keying means (58) , each of the locking fingers (70) terminating at a transversely extending locking tang (72), each said locking tang (72) having a cam surface (74) engageable with an associated one of the mounting bores (48) upon insertion of the hinge means (56) into the associated mounting bore (48), such that the locking tangs (72) cause the locking fingers (70) to be depressed toward the longitudinal axis until they exit from the mounting bore (48) whereupon they snap radially outwardly and the locking tangs (72) prevent removal of the hinge means (56) from the second housing (24;22).

20. A transceiver as claimed in any of claims 15 to 19, wherein:

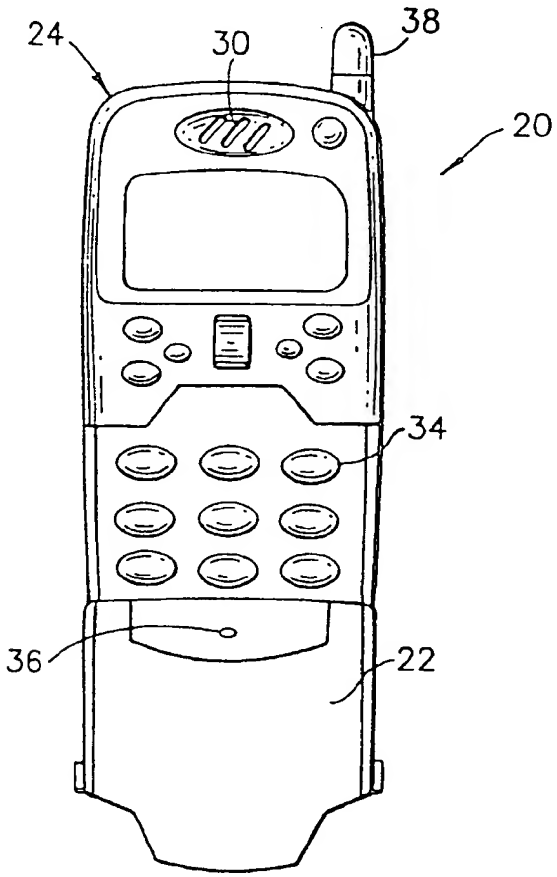
the hinge means (56) comprises a stub shaft (78);
the second housing (24;22) comprises an associated rib (78) having a bearing surface thereon for engagement with the stub shaft (78); and
the spring means (84) biases the stub shaft (78) into engagement with the associated rib bearing surface.

21. A transceiver as claimed in claim 20, wherein:

the second housing (24;22) comprises a post (80) for supporting an associated spring means (84), the post (80) having a bore (88) therein;
the spring means (84) has an elongated shank (86) with a transverse mounting flange (88) at one end thereof having a fastener hole (90) therein, and a resilient biasing portion (92) for holding the stub shaft (78) in engagement with the rib bearing surface; and
the transceiver further comprises a fastener (94) for fastening an associated spring to the second housing (24;22) by being received through the fastener hole in an associated mounting flange (88) and threadedly engaged with the bore in an associated post (80).

22. A transceiver as claimed in any of claims 15 to 21, wherein the hinge apparatus comprises two hinge means (56) and associated spring means (84).

FIG. 1



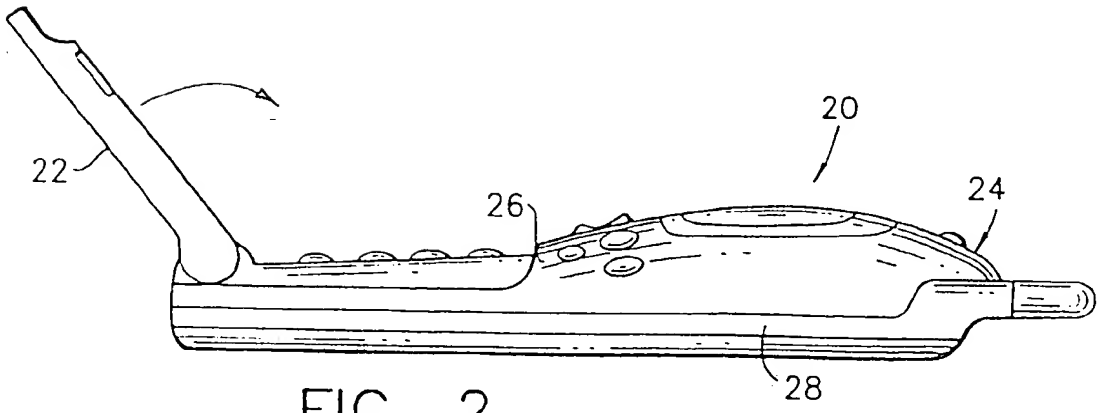


FIG. 2

FIG. 3

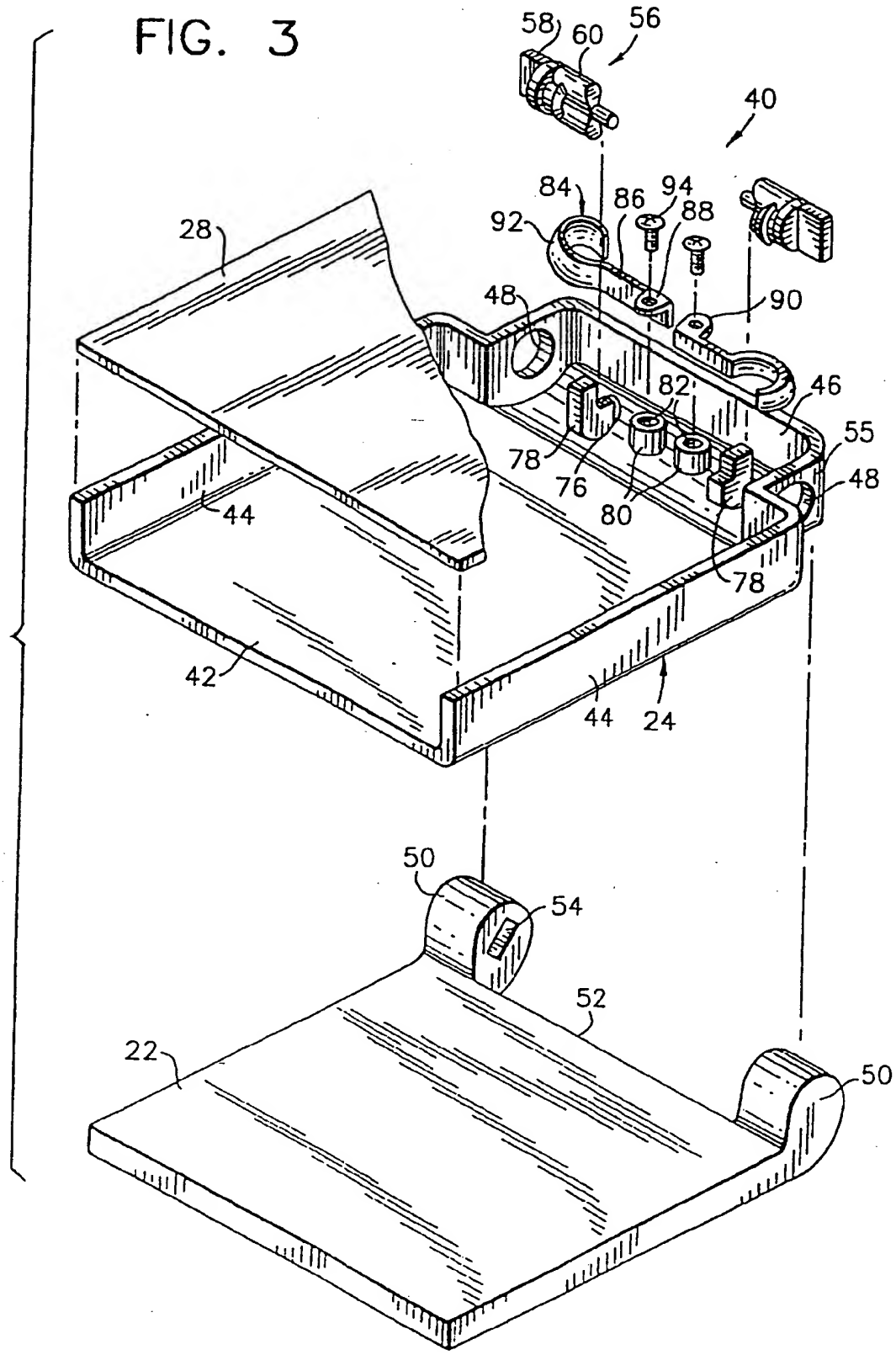
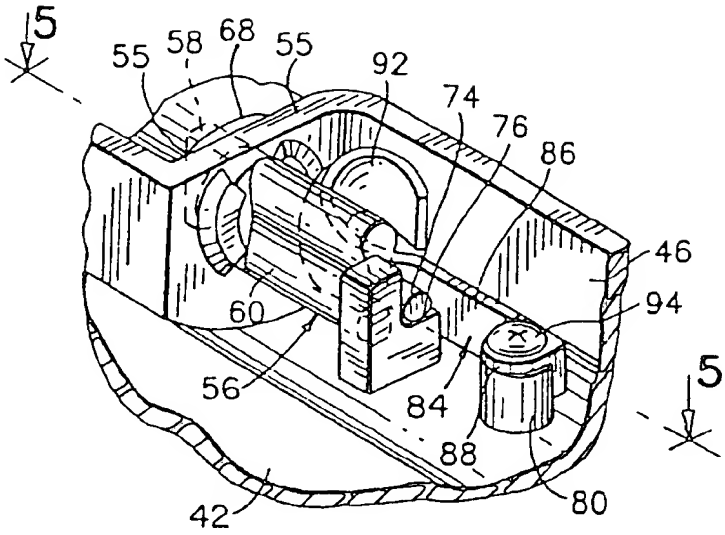


FIG. 4



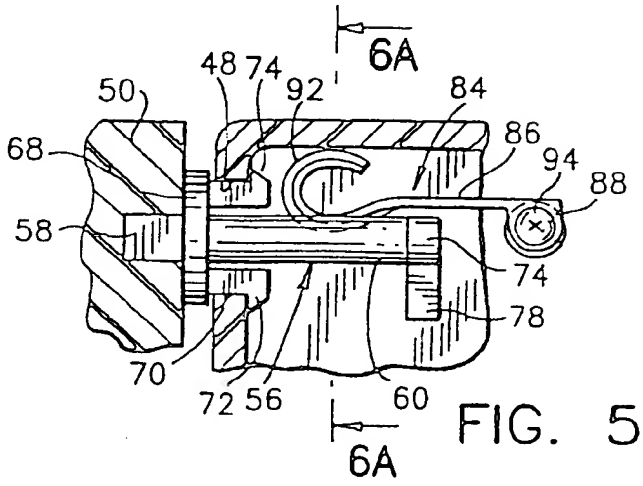


FIG. 5

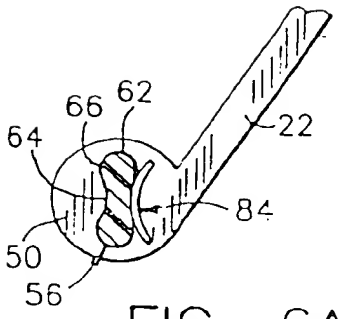


FIG. 6A

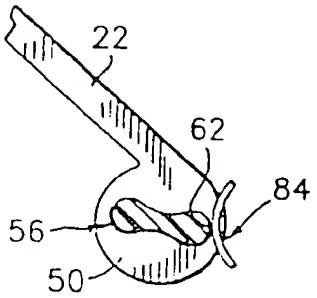


FIG. 6B

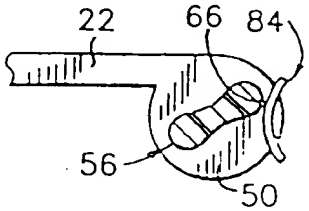


FIG. 6C

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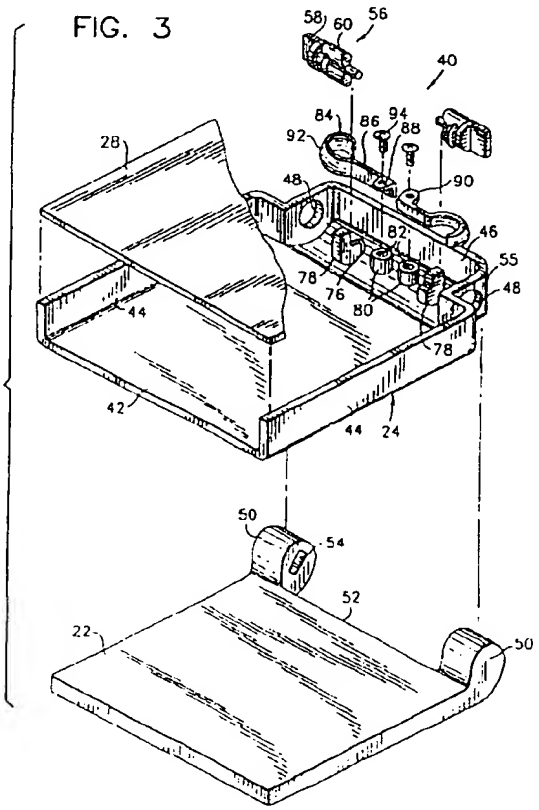
(54) Hinge mechanism for a portable telephone

(57) A unique hinge construction is provided for pivotally connecting a cover (22) to a main body (24) of a transceiver. The main body (24) comprises a base (42) and upstanding sidewalls (44) and an endwall (46). Movable between a closed position generally overlying the main body (24) and an operative angularly disposed position. the cover (22) includes a pair of spaced apart ears (50) projecting from an end thereof, said ears (50) having opposed key slots (54) formed therein being aligned with opposed mounting bores (48) in the sidewalls (44) adjacent the endwall (46). A pair of hinge shafts (56) are rotatably received in an associated one of the mounting bores (48) in the sidewalls (44) on the main body (24). Each hinge shaft (56) includes a key member (58) engageable with an associated one of the key slots (54) in the opposed ears (50) for rotation therewith and a central member (60) having a uniformly contoured outer surface defined by elevationally opposed convex shaped lobes, laterally opposed concave shaped depressions, and smooth transition zones joining the lobes and said depressions. A pair of spring members (84). each having a convex shaped surface (92) fixed to the main body (24) are biased into engagement with the uniformly contoured outer surface of its associated shaft means (56) for maintaining the cover (22) closed in one instance and in at least one operative position relative to the main body (24) in another instance.

FIG. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 7943

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 February 2000	de Biolley, L

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